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EXAMINER

BARTON, JEFFREY THOMAS

ART UNIT

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1795

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/726,744	Applicant(s) OLSEN ET AL.	
	Examiner Jeffrey T. Barton	Art Unit 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 May 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3,5-18,23-25 and 37-39 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3,5-18,23-25 and 37-39 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>20080227</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 22 May 2008 has been entered.

Response to Amendment

2. The amendment filed on 22 May 2008 does not place the application in condition for allowance.

Status of Rejections Pending Since the Office Action of 29 February 2008

3. The rejections of claims 1, 5, 6, 13-5, and 17-18 under 35 U.S.C. §102(b) as anticipated by DE 297 23 309 U1 are withdrawn due to Applicant's amendment.

4. The rejection of claims 1-3, 5, 10, and 18 under 35 U.S.C. §102(e) and anticipated by Stark is withdrawn due to Applicant's amendment.

5. The rejection of claims 6-9, 11, and 13-16 under 35 U.S.C. §103(a) as unpatentable over Stark is withdrawn due to Applicant's amendment.

6. All other rejections are maintained.

Declaration under 37 C.F.R. §1.131

7. The declaration filed under 37 CFR 1.131 on 22 May 2008 has been considered but is ineffective to overcome the Stark et al reference.

The declaration is only signed by three of the four named inventors in this application. (i.e. Larry C. Olsen, Peter M. Martin, and John G. DeSteeese) In order to be effective, a declaration under 37 C.F.R. §1.131 must be signed by all named inventors unless it is demonstrated that fewer inventors were responsible for the invention of the subject matter of the claims under rejection. Note MPEP §715.04 as to the formal requirements of declarations under 37 C.F.R. §1.131.

The Examiner notes the "Statement of Facts in Support of Filing on Behalf of Non-Signing Inventor John W. Johnston" by Derek H. Maughan, which accompanied the declaration under 37 C.F.R. §1.131. The examiner understands and appreciates the efforts made to contact the non-signing inventor, but the examiner does not have discretion to waive the requirement that all inventors sign the declaration. The following is an excerpt from MPEP §715.04:

Where one or more of the named inventors of the subject matter of the rejected claim(s) (who had originally signed the oath or declaration for patent application under 37 CFR 1.63) is now unavailable to sign an affidavit or declaration under 37 CFR 1.131, the affidavit or declaration under 37 CFR 1.131 may be signed by the remaining joint inventors provided a petition under 37 CFR 1.183 requesting waiver of the signature of the unavailable inventor be submitted with the affidavit or declaration under 37 CFR 1.131. Proof that the non-signing inventor is unavailable or cannot be found similar to the proof required for a petition under 37 CFR 1.47 must be submitted with the petition under 37 CFR 1.183 (see MPEP § 409.03(d)). Petitions under 37 CFR 1.183 are decided by the Office of Petitions (see MPEP § 1002.02(b)).

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Accordingly, if Applicant cannot obtain the signature of John W. Johnston on the Declaration before filing a response to this Office Action, Applicant should include such a petition under 37 C.F.R. §1.183 with the response, for consideration by the Office of Petitions.

Claim Rejections - 35 USC § 102

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

9. Claims 23 and 24 are rejected under 35 U.S.C. 102(b) as being anticipated by DE 297 23 309 U1 (DE '309).

DE '309 discloses a thermoelectric power source as shown in figure 1.

Regarding claim 23, DE '309 discloses the power source comprising a single flexible substrate, 1, having an upper surface and multiple thermoelectric couples, 4 (Figure 2), each comprising a sputter deposited thin film p-type thermoelement, 4', a sputter deposited thin film n-type thermoelement, 4", and an electrically conductive member, 4"', electrically connecting the ends of the thermoelements (figure 2 and page 4, paragraphs 2 to 5). The thermoelectric power source having a volume of less than about 10 cm³.and a power output from 1 μW to 1 W (page 2, paragraph 4). Due to the open "comprising" language of the preamble of claim 23, the claims are deemed to be

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open to additional elements, such as the additional films stacked in the device of Figure 1 of DE '309.

Regarding claim 24, in operation, the device of the '309 reference includes plural thermocouples connected electrically in series and thermally in parallel, which is considered to meet the limitations of the claim.

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

12. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was

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not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

13. Claims 1-3, 5-10, 12-15, 17, 18, 23-25, and 37-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Migowski (WO 89/07836; references below are made to the English translation of this document provided by Applicant) in view of Buist. (US 4,859,250)

Regarding claims 1, 23, and 37, Migowski discloses a thermoelectric power source comprising a flexible substrate having an upper surface (Page 3, 1st full paragraph); a plurality of thermoelectric couples, with the thermoelectric couples comprising: sputtered thin film p- and n-type thermoelements (1 and 2) as claimed (Paragraph bridging pages 2 and 3; Page 3, 1st full paragraph; Page 4, paragraph beginning with "Figure 1a . . .") and an electrically conductive member (3) positioned on the flexible substrate and connecting the p- and n-type thermoelements as claimed (Figure 2; Page 4, paragraph beginning with "Figure 1a . . ."); wherein the thermocouples are electrically connected to each other on the surface (Figures 2, 4); wherein the thermoelectric couples are formed on a single substrate and rolled into a coil configuration (Paragraph bridging pages 2 and 3); and wherein the output of the device is between 1 microwatt and 1 watt. (Page 4, paragraph beginning with "Layer thickness: . . .")

Regarding claims 2, 3, and 25, Migowski teaches element lengths of 0.75 mm and widths of 0.1 mm. (Page 4, paragraph beginning with "Layer thickness: . . .") This

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provides an area of 0.075 mm^2 , and an L/A ratio of 10 mm^{-1} , which meets the limitations of these claims. (i.e. the limitation "about 100 cm^{-1} " is open to ratio values above and below this value)

Regarding claims 5 and 6, Migowski teaches 7500 thermocouples on a substrate, which produces 11 microwatts at 1.6V. (Page 4, paragraph beginning with "Layer thickness: . . .")

Regarding claim 8, Migowski teaches thermoelements that are 5 micrometers thick. (Page 4, paragraph beginning with "Layer thickness: . . .")

Regarding claims 13 and 39, Migowski teaches rolling a 30 cm long polyimide film (Paragraph bridging pages 2 and 3) having thermocouples with exemplary dimension of about 0.75 mm wide (Page 4, paragraph beginning with "Layer thickness: . . ." in conjunction with orientation of figure 2) Such a rolled-up device will clearly have volume less than 10 cm^3 . Migowski further teaches outputs of about 11 microwatts. (Page 4, paragraph beginning with "Layer thickness: . . .")

Regarding claim 15, Migowski teaches power output with a temperature difference of 6°C . (Page 4, paragraph beginning with "Layer thickness: . . .")

Regarding claim 18, Migowski teaches a polyimide substrate. (Page 3, 1st full paragraph)

Regarding claim 24, upon coiling and positioning in the watch, the thermocouples of Migowski will be positioned electrically in series and thermally in parallel, which meets the limitations of the claim.

Although Migowski suggests forming the thermocouples from known materials, including Bi and Te (Page 3, 3rd full paragraph), he does not explicitly teach Bi_2Te_3 as the thermoelectric material.

Buist is cited as teaching sputtered thin films of n- and p-type Bi_2Te_3 as thermoelectric material used in forming thermocouples on a substrate. (Figure 2a; Column 2, line 66 - Column 3, line 8) Specific to claim 17, this material is not disclosed as comprising selenium.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the device of Migowski by specifically selecting Bi_2Te_3 as the thermoelectric material, as taught by Buist, because Migowski suggests forming the thermocouples from bismuth and tellurium, and Buist demonstrates the effectiveness of this material as p- and n-type thermoelectric material. The selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945).

Further regarding claims 2, 3, 7, 9-10, 14, 23, 25, and 38, the choice of a specific volume for the device and a power output are dependent on the specific application for the device. The specific wiring methods, series or parallel, also affects the power/current outputs for the device and are well known within the art to alter the wiring to meet the specific requirements of an application. Absent any unexpected results, it would have been obvious to one of ordinary skill in the art at the time the invention was made to choose a specific volume, wiring method and output power as within the claims

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for the device of Migowski. The choice of element length and width, as well as the ratio between them, is a further design choice that is obvious to one skilled in the art, absent any evidence of criticality or unexpected results. Therefore these claims are also obvious over the combination of art described above.

Regarding claim 12, the limitation to "co-sputter deposited thin films" is directed to formation of a product by a process, which does not further define the structure of the claimed device. "[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985)

There is no difference evident between the thermoelements of the instant claims and those taught by the prior art as described above.

14. Claims 11 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Migowski and Buist as applied to claims 1-3, 5-10, 12-15, 17, 18, 23-25, and 37-39 above, and further in view of Bass et al. (US 6,207,887)

Migowski and Buist are relied upon for the reasons given above.

Neither Migowski nor Buist explicitly discloses a device with pluralities of thermoelements connected in series and parallel precisely as claimed.

Bass et al disclose a series-parallel connection scheme for a thermoelectric generator (Figure 13A; Column 6, lines 46-62) in which plural n-type elements are connected electrically in parallel and are connected in series to a plurality of p-type elements that are connected to each other in parallel.

It would have been obvious to one having ordinary skill in the art to further modify the device of Migowski by employing the series-parallel connection scheme of Bass et al, because Bass et al teach that such connection protects against complete power loss in the event of damage to a single thermoelement, thus providing increased reliability. (Column 6, lines 46-62)

15. Claims 23-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stark et al (U.S.P.G.Pub 2004/0231714).

Stark discloses a thermoelectric power source as shown in figure 1.

Regarding claim 23, Stark discloses the thermoelectric device is comprised of thin film semiconductors assembled in alternating p- and n-type arrays (figure 2 and paragraph 0029) on a single flexible polyimide substrate. (Figure 2, Paragraph 0041) Stark discloses sputter depositing thin film p-type thermoelements, 34, sputter depositing thin film n-type thermoelements, 32, and an electrically conductive metal bridge, 26, connecting the ends of the thermoelements (figure 2 and paragraphs 0032, 0035 and 0044).

Regarding claim 24, Stark discloses that the thermocouples are connected electrically in series and thermally in parallel, which meets the limitation of the claim. (Figures 1 and 2; Paragraph 0035)

Regarding claim 25, figure 3 shows p-type elements having different widths than the n-type elements.

The differences between Stark and the claims are the requirements of a specific volume and power output.

The choice of a specific, volume for the device and a power output are dependent on the specific application for the device. Absent any unexpected results, it would have been obvious to one of ordinary skill in the art at the time the invention was made to choose a specific volume and output power as within the claims for the device of Stark. Also Stark discloses the choice of number of thermocouples within the device is dependent on the required power for the device (paragraph 0039), thus making this choice determines the power output and the device size. Therefore the claims are obvious over Stark.

16. Claims 1-3, 5-10, 12-15, 17, 18, and 37-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stark et al (U.S.P.G.Pub 2004/0231714) in view of Barr et al. (U.S. 4,036,665).

Stark discloses a thermoelectric power source as shown in figure 1.

Regarding claims 1 and 37, Stark discloses the thermoelectric device is comprised of thin film semiconductors assembled in alternating p- and n-type arrays

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(figure 2 and paragraph 0029). Stark discloses sputter depositing thin film p-type thermoelements, 34, sputter depositing thin film n-type thermoelements, 32, and an electrically conductive metal bridge, 26, connecting the ends of the thermoelements (figure 2 and paragraphs 0032, 0035 and 0044). Stark discloses the use of Bi_2Te_3 . (Paragraph 0023)

Regarding claims 2 and 3, the dimensions of Stark gives L/A ratios of greater than 100 cm^{-1} (thickness of 5 microns, width of 10 microns, length of 100 microns; see paragraphs 0032 and 0034).

Further, regarding claims 7 and 8, the dimensions disclosed by Stark include at least 0.1 mm in width and at least 20 angstroms in thickness (paragraphs 0032 and 0034). Also Stark discloses the use of greater than 50 or 1000 thermocouples (paragraph 0039).

Regarding claim 10, figure 3 shows p-type elements having different widths than the n-type elements.

Regarding claim 18, Stark discloses the use of polyimide as the substrate (paragraph 0041).

The difference between Stark and claims 1 and 37 is the requirement of a coiled substrate configuration. The difference between Stark and claim 17 is the requirement of a specific n-type element. The differences between Stark and claims 5-9, 11, 13-16, 38, and 39 are the requirements of specific power outputs, electrical configurations, volume of the device and element lengths.

Barr teaches a thermopile for a thermoelectric generator. The thermopile is shown in figure 1 and comprises bismuth telluride elements sputter deposited onto a polyimide substrate (abstract). The substrate is coiled up (column 2, lines 58-61). Barr further teaches the use of n-type dopants such as cuprous bromide, silver iodide and antimony iodide (column 2, lines 47-49).

Regarding claims 1 and 37, it would have been obvious to one of ordinary skill in the art at the time the invention was made to coil up the substrate as within Barr for the device of Stark, because the coiled substrate is pencil thin, thus taking up much less space. It would have been further obvious to one of ordinary skill in the art at the time the invention was made to utilize an n-type dopant as within Barr to dope the n-type elements of Stark because Barr discloses dopants are commonly used n-type dopants in the art. Because Barr and Stark are both concerned with thin film thermoelectric devices, one would have a reasonable expectation of success from the combination.

Regarding claims 5-9, 11, 13-16, 38, and 39, the choice of a specific volume for the device and a power output are dependent on the specific application for the device. The specific wiring methods, series or parallel, also affects the power/current outputs for the device and are well known within the art to alter the wiring to meet the specific requirements of an application. Absent any unexpected results, it would have been obvious to one of ordinary skill in the art at the time the invention was made to choose a specific volume, wiring method and output power as within the claims for the device of Stark. Also Stark discloses the choice of number of thermocouples within the device is dependent on the required power for the device (paragraph 0039), thus making this

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choice determines the power output and the device size. The choice of element length is a further design choice that is obvious to one skilled in the art. Therefore the claims are obvious over Stark.

Regarding claim 12, the limitation to "co-sputter deposited thin films" is directed to formation of a product by a process, which does not further define the structure of the claimed device. "[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985) There is no difference evident between the thermoelements of the instant claims and those taught by the prior art as described above.

17. Claims 11 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stark and Barr as applied to claims 1-3, 5-10, 12-15, 17, 18, 23-35, and 37-39 above, and further in view of Bass et al. (US 6,207,887)

Stark and Barr are relied upon for the reasons given above.

Neither Stark nor Barr explicitly discloses a device with pluralities of thermoelements connected in series and parallel precisely as claimed.

Bass et al disclose a series-parallel connection scheme for a thermoelectric generator (Figure 13A; Column 6, lines 46-62) in which plural n-type elements are

connected electrically in parallel and are connected in series to a plurality of p-type elements that are connected to each other in parallel.

It would have been obvious to one having ordinary skill in the art to further modify the device of Stark by employing the series-parallel connection scheme of Bass et al, because Bass et al teach that such connection protects against complete power loss in the event of damage to a single thermoelement, thus providing increased reliability.
(Column 6, lines 46-62)

Response to Arguments

18. Applicant's arguments filed 29 November 2007 have been fully considered but they are not persuasive.

Applicant's arguments that a DE '309 reference does not disclose forming thermocouples on a single substrate are not persuasive, because the open "comprising" language of the claims does not preclude additional substrates beyond that described in the claim. DE '309 teaches an individual substrate meeting the limitations of claim 23, and the rejection is therefore maintained.

Applicant's arguments that Stark is not available as prior art are not persuasive due to the deficiencies in the declaration under 37 C.F.R. §1.131, as noted above.

Applicant's further arguments concerning the limitation to "co-sputter deposited thin films" are not persuasive because this limitation is solely directed to formation of a product by a specified process, which does not further define the structure of the claimed device. "[E]ven though product-by-process claims are limited by and defined by

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the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.” *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985)

There is no structural difference evident between the thermoelements of claim 12 and those taught by the prior art as described above.

Applicant's arguments concerning claims 11 and 16 have been considered, but are moot in view of the new grounds of rejection presented above.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Jeffrey T. Barton whose telephone number is (571)272-1307. The examiner can normally be reached on M-F 9:00AM - 5:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Jeffrey T. Barton/
Art Unit 1795
31 July 2008